

Lower limb venous compliance is different between men and women following 60 days of head-down bedrest but is not associated with venoconstriction dysfunction

Christian M. Westby¹, Stuart M. C. Lee², Michael B. Stenger², Steven H. Platts³

¹University Space Research Association, Houston, TX, United States

²Wyle Integrated Science and Engineering Group, Houston, TX, United States

³NASA, Johnson Space Center, Houston, TX, United States

Space flight-induced orthostatic intolerance (OI) is more prevalent in female (F) than male (M) astronauts. The mechanisms explaining the higher incidence of OI in F are unclear. We tested the hypothesis that venous compliance would be higher in F more than M following 6° head-down bed rest (BR) and would be associated with constrictor dysfunction. Using 2-D ultrasound, dorsal hand (DHV) and dorsal foot (DFV) vein compliances were determined in 24 subjects (10 F, 14 M; 35±1 yr) by measuring mean diameter response to increasing congestion pressure (0, 20, 30, and 40 mmHg) before and after 60 d of BR. Constrictor function was assessed by intravenous infusions of Ketorolac (KE; 1.5 µg/min) Phenylephrine (PE; 3160 ng/min), and L-NMMA (50 µg/min). The effects of BR between F vs. M and hand vs. foot were determined using mixed-effects linear regression. DFV but not DHV compliance changed in response to BR ($p=0.012$). Mean DFV increased significantly (0.903 mm to 1.191mm) in F but decreased in M (1.353 mm to 1.154 mm). DFV constrictor response was not different between sexes in response to BR (KE; $p=0.647$, PE; $p=0.717$, and L-NMMA; $p=0.825$). These BR data suggest that the higher incidence of OI in F astronauts may be related to increased lower limb venous compliance, contributing to blood pooling upon standing. Notably, changes to DFV compliance was not accompanied by impaired constrictor function.